

Natural User Exits

A Natural user exit is a programming object that is invoked by Natural, a subcomponent or a subproduct. Usually, a sample user exit is delivered in source form. The instructions contained in the user exit have to be written or adjusted by the user. The purpose of a user exit is to manipulate data or make decisions. Most user exits take advantage of the Natural programming language; a small subset has to be written in Assembler language.

This document describes the following Natural user exits:

- NATUEX1 - User Exit for Authorization Control
- NATSREX2 and NATSREX3 - User Exits for Sort Processing
- NATUSKnn - User Exit for Computation of Sort Keys
- NATPM - User Exit for Inverted Output

See also:

- Application Programming Interfaces in Library SYSEXT
- Term Application Programming Interface (in the Glossary)
- NATJRE Utility User Exit

Other Natural user exits and application interfaces are described in the relevant places in the Natural subcomponent or subproduct documentation (Natural RPC, TP monitor interfaces, utilities, add-on products, etc.).

Configuring Natural - Other Topics:

Linking Natural Objects to the Natural Nucleus | Natural Application Programming Interfaces | Natural User Access Method for Print and Work Files | Natural Scratch-Pad File | Natural Text Modules | Natural Configuration Tables | Natural Storage Management

NATUEX1 - User Exit for Authorization Control

The user exit NATUEX1 is called whenever a user session is activated. It can be used to determine whether or not the user is authorized to use Natural. The security data used to determine this can be retrieved from the security system being used (for example, RACF or ACF2).

NATUEX1 is called using standard calling conventions:

Register	Contents
15	Entry address of NATUEX1
14	Return address of Natural
13	Address of a save area of 18 words
1	Address of a parameter list

The parameter list contains five addresses:

Address	Points to an 8-byte field containing the value which is used to fill the Natural system variable
1	*INIT-USER
2	*ETID
3	*INIT-ID
4	*INIT-PROGRAM
5	*USER (Note that this system variable will be overwritten during a Natural Security logon.)

These five values can be modified by the user exit.

For normal completion, the user exit must return control with Register 15 set to "0". If Register 15 does not contain "0", the Natural session is terminated with the condition code equal to the value in Register 15.

NATUEX1 can be linked to a shared nucleus or to an environment-independent nucleus. It is also possible to link it to an alternative parameter module, or as a separate module if you are running with profile parameter RCA.

For CICS: See also NCIUIDEX User ID Exit Interface in the Natural TP Monitor Interfaces documentation.

NATSREX2 and NATSREX3 - User Exits for Sort Processing

Natural provides two user exits for sort processing: NATSREX2 and NATSREX3.

The two user exits can be used with Natural's own sort program as well as with an external sort program. The exits are activated automatically when they are linked to the nucleus and so their addresses get resolved. Since, under OS/390 and VSE/ESA, many external SORT programs already supply several exit functions, the exits NATSREX2 and NATSREX3 may especially be used either with Natural's internal sort program or with external SORT under BS2000/OSD.

NATSREX2 is always called when Natural passes a record to the sort program. NATSREX3 is called when the sort program, upon completion of the sort run, passes a record to Natural. The example delivered shows how you can establish your own collating sequence for a SORT.

When the user exits are activated, the following register conventions must be adhered to:

Register	Contents
15	Entry addresses of NATSREX2 and NATSREX3
14	Return address of Natural
13	Address of the 18-word save area
1	Address of the sort record
3	Length of the sort record

The user exits have to secure the Natural registers and restore them upon returning control to Natural.

As the sort exit module is linked to the module NAT2SORT, programming has to be reentrant. The format and structure of the sort records must not be modified.

NATUSKnn - User Exit for Computation of Sort Keys

Some national languages contain characters which are not sorted in the correct alphabetical order by a sort program or database system. With the system function SORTKEY you can convert such "incorrectly sorted" characters into other characters that are "correctly sorted" alphabetically.

When you use the SORTKEY function in a Natural program, the user exit NATUSKnn will be invoked - *nn* being the current language code (that is, the current value of the system variable *LANGUAGE).

You can write a NATUSKnn user exit in any programming language that provides a standard CALL interface. The character-string specified with SORTKEY will be passed to the user exit. The user exit has to be programmed so that it converts "incorrectly sorted" characters in this string into corresponding "correctly sorted" characters. The converted character string is then used in the Natural program for further processing.

For the conversion, NATUSKnn may use the translation table NTUTAB1 of the configuration module NATCONFIG; this means that NTUTAB1 may have to be adjusted accordingly.

NATUSKnn is called using standard calling conventions:

Register	Contents
15	Entry address of NATUSKnn
14	Return address of Natural
13	Address of a save area of 18 fullwords
1	Address of a parameter list

The parameter list contains the following addresses:

Offset	Address of
+0	The character string passed from Natural.
+4	The length of the character string (fullword).
+8	The character string resulting from the conversion.
+12	The length of the result string (fullword).
+16	The translation table NTUTAB1.

NATUSKnn has to secure all registers, except 14 and 15, and restore them upon returning control to Natural.

For normal completion, the user exit must return control with Register 15 set to Return Code "0". If Register 15 does not contain "0", a corresponding Natural error will be issued.

A sample user exit, NATUSK01, is provided in source form: It applies to English and converts all English lower-case letters in the character string to upper-case.

When a shared nucleus is used, NATUSKnn can be linked to the environment-independent part of the nucleus.

It is also possible to link it to an alternative parameter module, or as a separate module if you supply the name(s) of the invoked NATUSKnn module(s) with the profile parameter RCA.

For linkage and loading conventions, see also the CALL statement in the Natural Statements documentation.

NATPM - User Exit for Inverted Output

The NATPM module is used to support inverse direction terminals. It contains the user exit routine for field and line conversion which is called by Natural at terminal I/Os if for some fields the print mode (PM parameter) has been set to "I".

PM=I indicates inverse direction and is used to support languages writing from right to left (for example, bi-directional languages); see also the description of the PM parameter.

The module NATPM is delivered as a source module and can be modified if required.

Inversion Logic

Natural provides a user-exit routine which is called for each field where the resulting attribute is PM=I and for each line to be printed via hardcopy, additional report and primary batch output. This exit is called with three parameters:

- the source field to be inverted,
- the target field to receive the inverted data,
- a length field specifying the length of the source and target fields.

As this user exit routine is available in source code to all users, it might be used as an explicit field exit triggered by the PM=I attribute. The user is then able to check and modify line contents or field contents.

Field User Exit

The user exit in NATPM will be called for every field where the attribute PM=I is set.

This attribute can be set by the Natural programmer, or is automatically set for numeric fields when the global print mode is set to PM=I. It does not matter whether the output is generated for the terminal, for hardcopy, for additional reports or for the primary output in batch.

For printing devices, Natural does not expect automatic inversion from the hardware, but calls NATPM again for the complete line. This feature can be used in countries where the field inversion is not required to establish interface logic with Natural based on a field attribute.